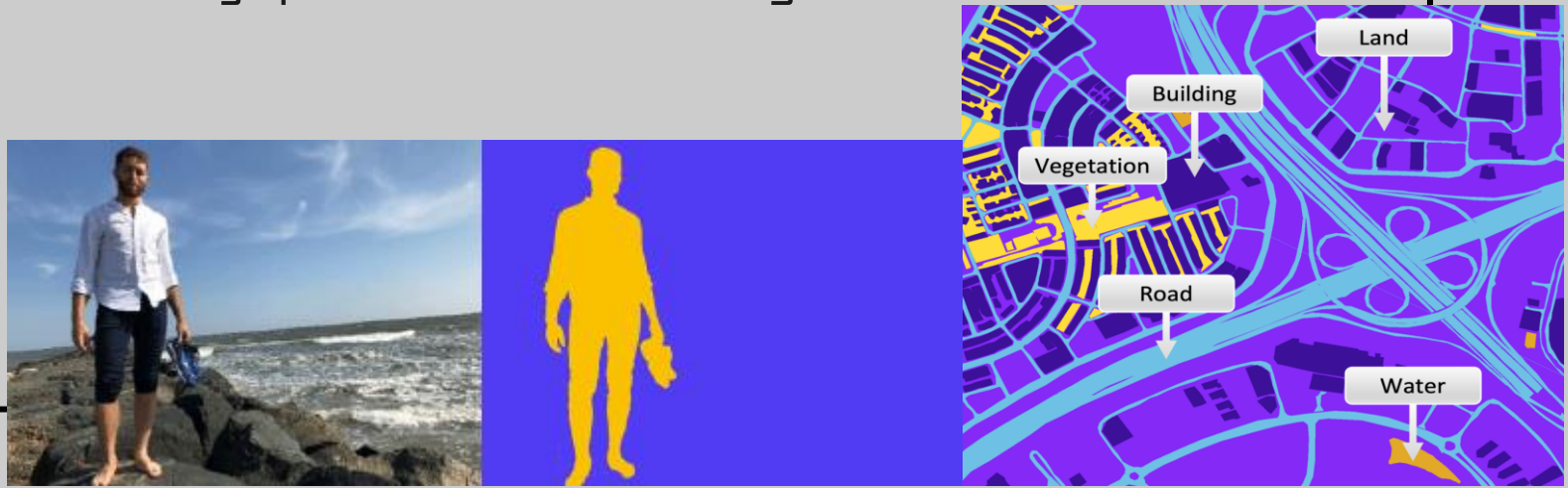
Semantic Segmentation of Buildings in Stellite Images

By: Lorena Robles

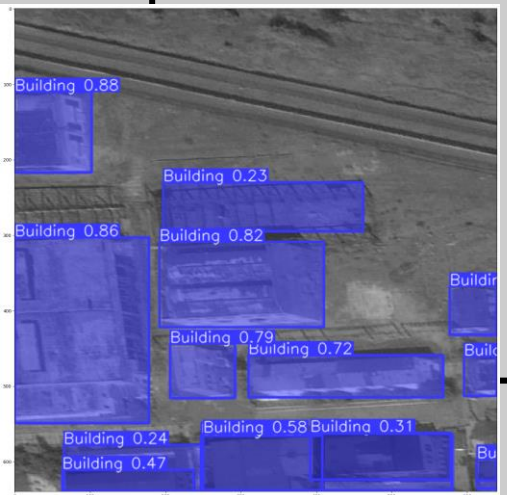
What is Semantic Segmentation?

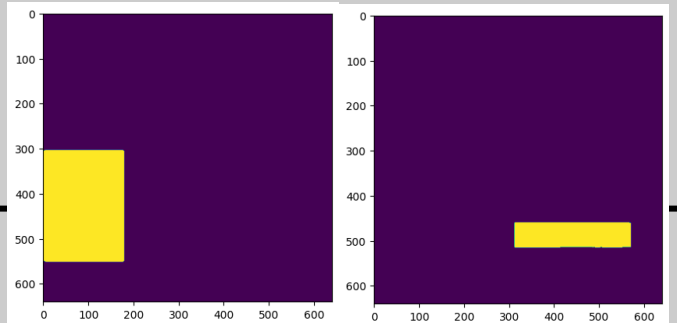
- Semantic segmentation is a deep learning algorithm that associates a label or category with every pixel in an image

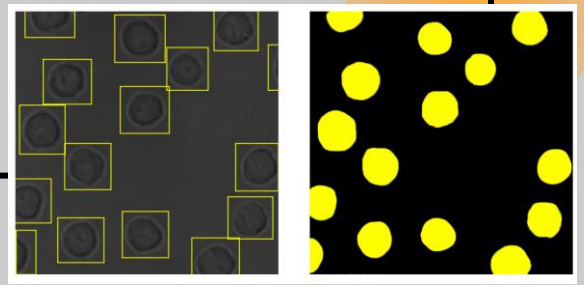


Why is it useful?

- Semantic segmentation allows the object of interest to span multiple areas in the image at the pixel level.
    - Detects objects that are irregularly shaped, in contrast to object detection, where objects must fit within a bounding box





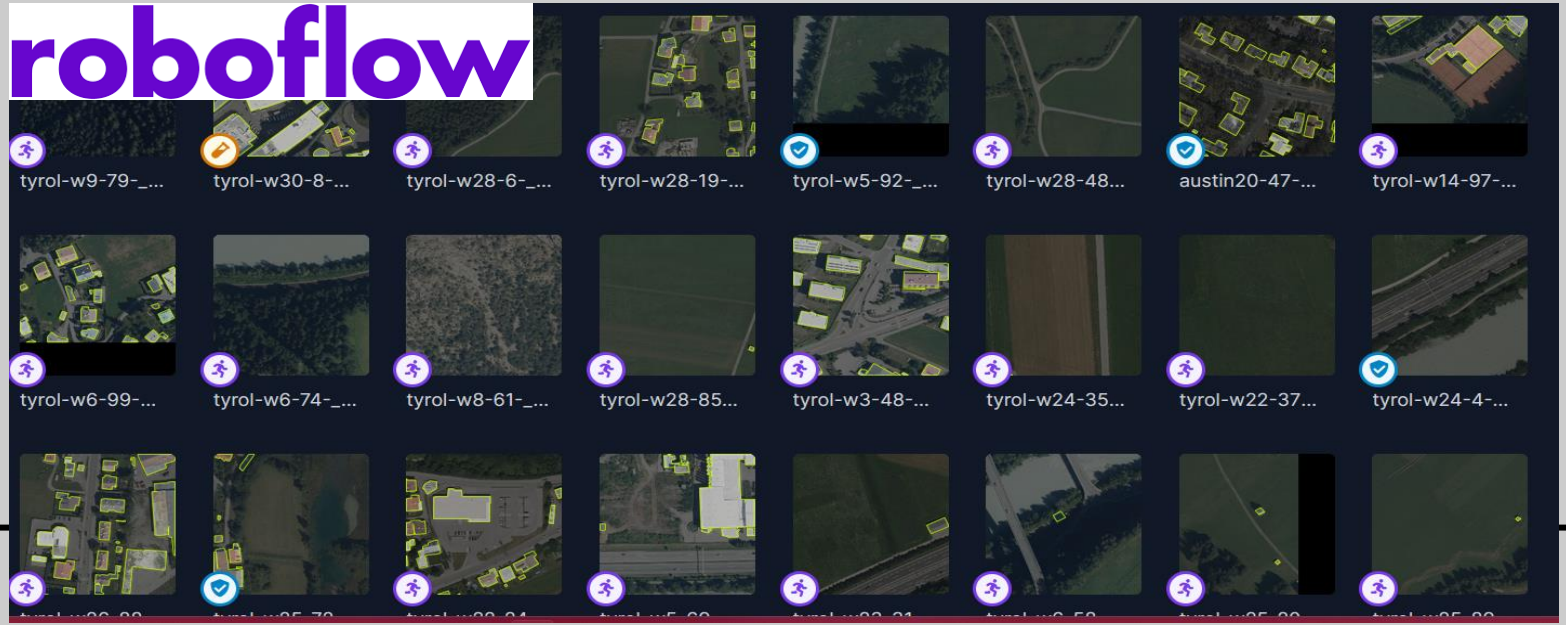


Project Objective:

To train the newly developed Yolov8 model for segmentation of buildings using satellite images.

Dataset:

- Roboflow Universe Data
- 13,528 Train Images, 82%
- 1,934 Validation Images 12%
- 967 Test Images 6%

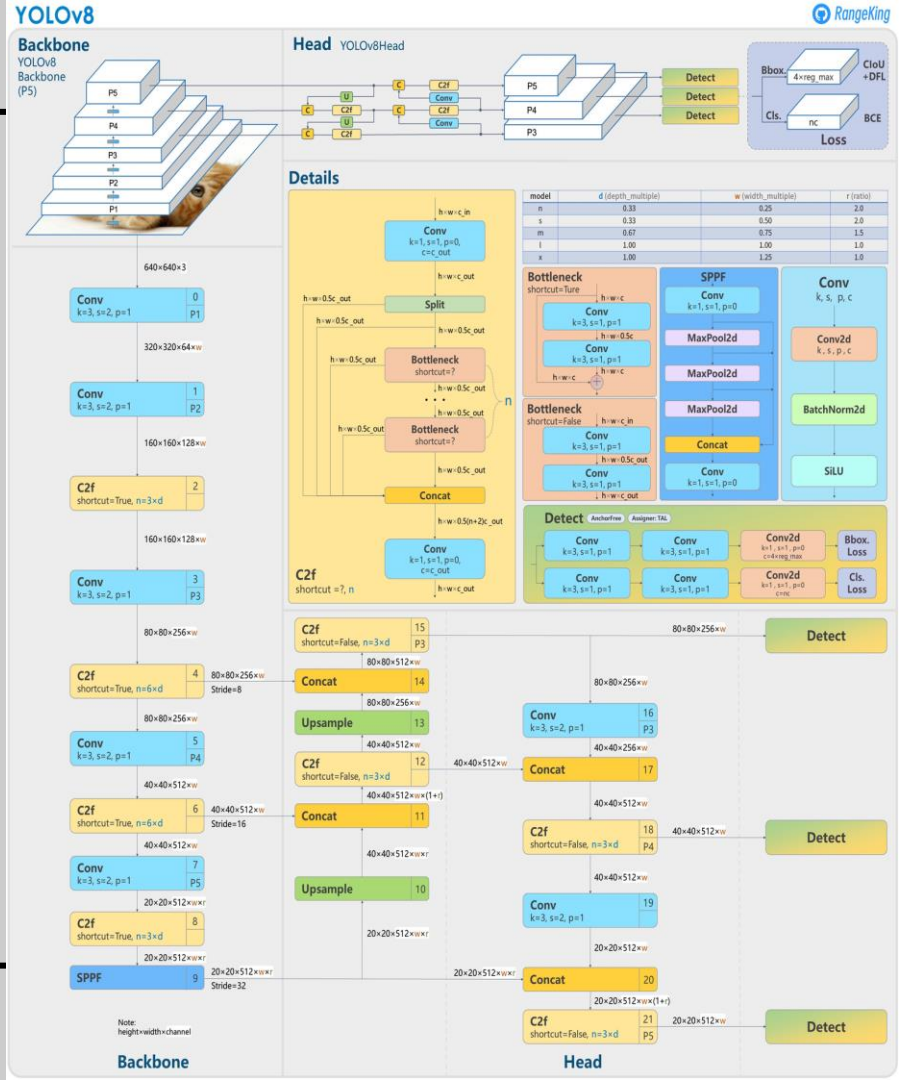


You Only Look Once

- Launched in 2015
- Based on Pytorch
- Originally developed for object detection

Model Architecture

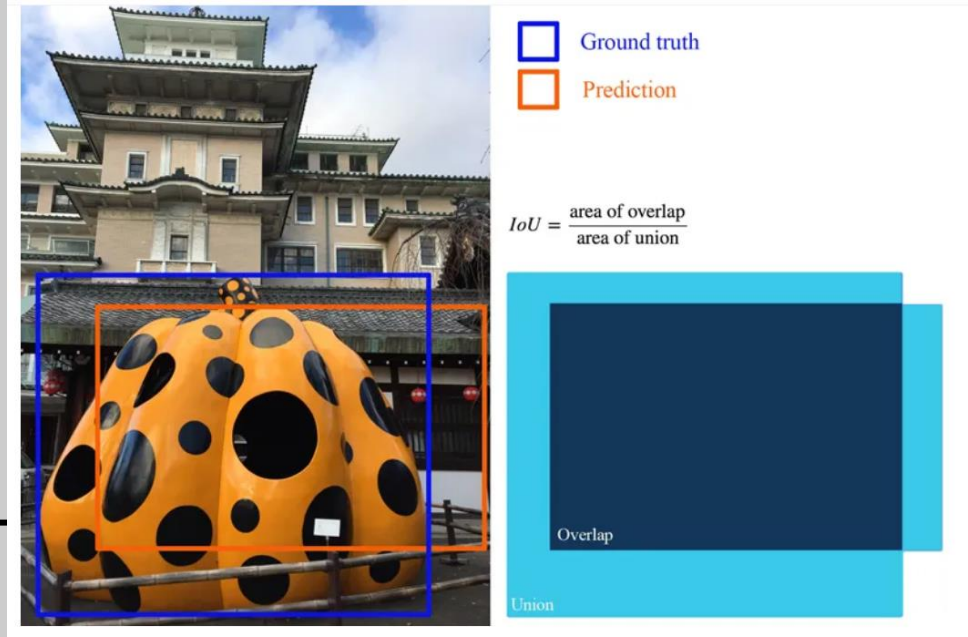
- Backbone of 5 Convolutions
- Anchor free feature detection
- Feature Detection is based on:
  - How tight the bounding boxes are to the true object
  - Correctness of the Classification



Model Evaluation

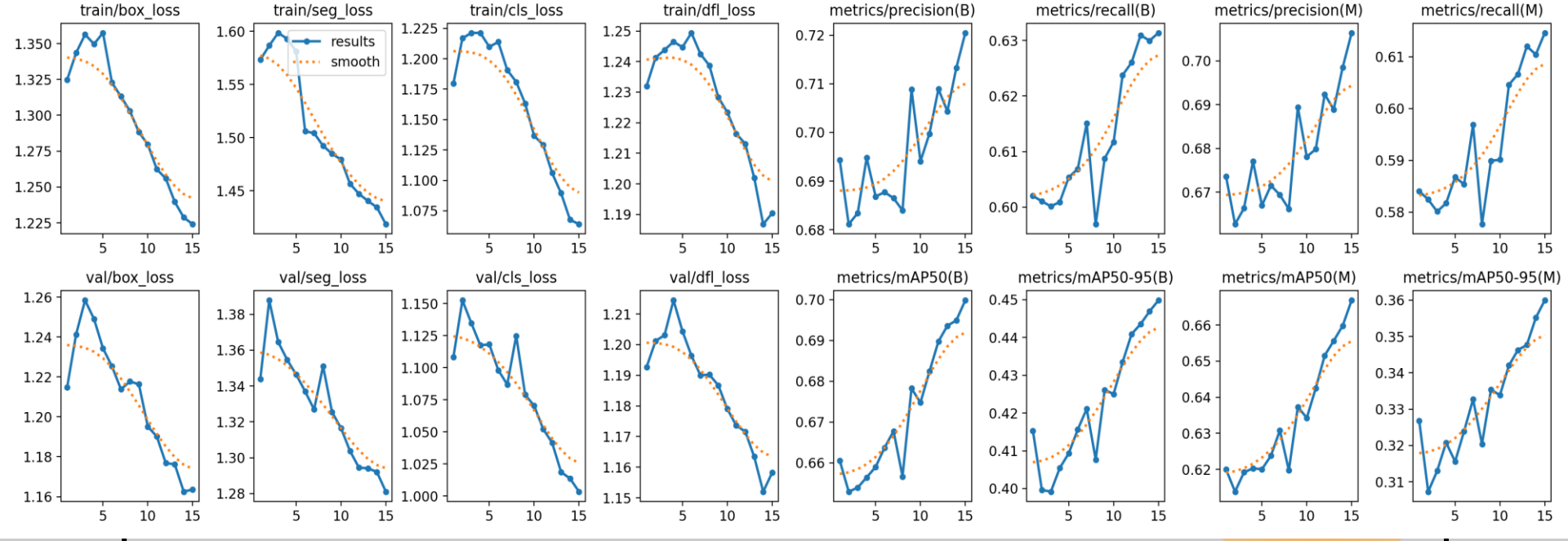
- **mApval:**
- Mean Average Precision over multiple Intersection vs Union Measures

- **Box_Loss**
- **Segmentation Loss**
- **Cls_Loss**: Difference between probability distributions



Yolov8 Model in Training

15 Hours of training (25 epochs)



Some Example Predictions:

Some Example Predictions:

Some Example Predictions:

Some Example Predictions:

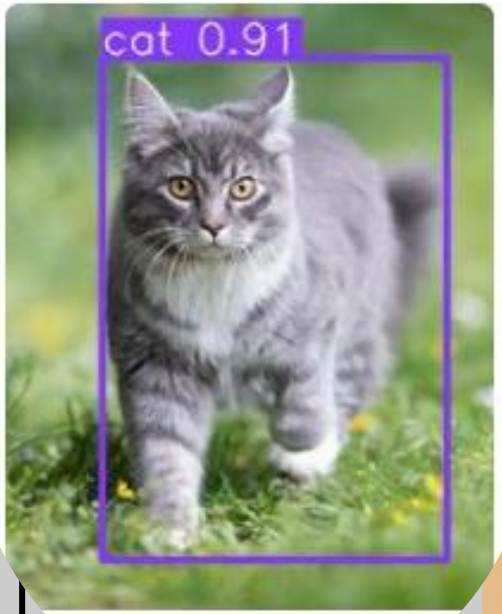
Some Example Predictions:

Key Takeaways

Computational Expense and the time required for appriate Freature Engineering **MUST** carefuly evaluated while designing computer vision project timelines!

- The model will need to train for at least twice the amount of time
- Compared the results of the Yolov8 algorithm to other popular segmentation model architectures such as the Fully Convolutional Network

Future Steps



Thanks!

Do you have any questions?

https://www.linkedin.com/in/lroblesm